

# COMANCHE: LEADING THE ARMY'S TRANSFORMATION

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## Introduction

On April 4, 2000, the RAH-66 Comanche Program completed a successful Milestone II review that accelerated it into the engineering and manufacturing development phase of procurement. Key to this was the realization that the Comanche is on the cutting edge of the Army's transformation to a more responsive, deployable, agile, versatile, lethal, survivable, and sustainable force capable of responding to missions across the full spectrum of conflict.

Comanche designers got it right this time. By factoring in evolving threats, the need for deployability, multimissions, multiroles, and ease of upgrade, they designed Comanche for the future. Comanche will be Army aviation's bridge to a transformed force, and will fit the aviation community's new multifunctional battalions much more than a reconnaissance and attack helicopter. Comanche's integrated communications systems, multispectral sensors, mobility, low observability, and high operational tempo (OPTEMPO) combine to provide the ground commander unprecedented information dominance in multiple environments and across the spectrum of conflict. Studies show that when the Comanche is teamed with the Longbow Apache, total force effectiveness is exponentially increased.

Comanche's digital, open-system architecture is designed to facilitate future growth and integration of commercially developed processors and other rapidly evolving technologies. Provisions for growth and changes were planned from the initial design; therefore, Comanche

will evolve as technology and the threat evolve.

Comanche was designed as a system, not as a group of individual attributes. Its mission equipment package and airframe combine to form a new tool for the ground commander—one that is ready to support the evolving force.

## Onboard Sensors

Comanche's primary target acquisition system is the Second Generation Forward Looking Infrared (FLIR), which increases target acquisition range by 50 percent compared to FLIR systems fielded today. Comanche's futuristic mission equipment package will reduce extended unmasking of the aircraft to evaluate large numbers of false targets. The Aided Target Detection/Classification (ATD/C) System receives sensor inputs, performs a set of pattern-matching operations, and presents targets to the crew for identification. Detected targets can then be shared with other combat assets or be used onboard for an engagement cycle.

The location and symbolic electronic map overlay data, as well as target images or sensor video, can be transmitted to other users. Other Comanche sensors include the advanced solid-state day TV, a radar warning receiver, a laser warning receiver, and the radio frequency (RF) interferometer. Information from these sensors can be fused with fire control data provided by predictive fire control software to convey extremely accurate data.

Part of the Comanche fleet will be equipped with the Comanche radar. Comanche radar has the capability to look

at the environment in the millimeter-wave frequency in addition to the infrared (IR) and visible spectrums. The fusing of these two independent ATD/C systems (radar and IR) results in near-zero false alarms. Comanche also has an automated search-on-the-move capability and an automated air search capability that significantly enhances counter reconnaissance and the detection of threat unmanned aerial vehicles.

Comanche's sensors, coupled with the man-in-the-cockpit, allow it to establish a recognition and identification level of situational awareness (SA) that other surveillance assets can't always provide. The Comanche system and its crew identify targets and generate and maintain track files for all identified targets. Comanche will reduce fratricide and provide commanders with unparalleled knowledge of the battlefield. Additionally, Comanche will have provisions for an integrated chemical sensor that automatically detects, classifies, and determines the concentration of chemical agents. Provisions are also provided for airborne radiological survey sensors, and the cockpit is overpressurized with filtered air to allow the crew to operate in chemical-biological environments without being in a full MOPP IV (mission-oriented protective posture).

## Communications Package

The modern digital battlefield is characterized by Joint Contingency Force (JCF) Operations. These include a combination of Army, Air Force, Navy, Marine Corps, NATO, and/or allied country combat forces. Our national military strategy implies that battlefield geography will vary for most combat scenarios. Consequently, the JCF commander will tailor supporting assets based on mission objectives, intelligence information, and enemy order of battle. The accuracy and timeliness of information distribution will dramatically influence operational success.

Comanche provides a systems approach to ensure the integration of battle command functions. Data exchange and communication protocols are designed for integration with other Services and allies. Shared data will provide a common operating picture up and down the chain of command.

# RAH-66 Comanche

***Comanche is....***

- **Rapidly Deployable**
- **Lethal**
- **Survivable**
- **Sustainable**
- **Versatile**
- **Agile**
- **Responsive**



***It Embodies the Army's Vision***

Integrated Communication Navigation Identification Avionics (ICNIA) is the term used to describe this system jointly developed with the U.S. Air Force F-22 Program. ICNIA has the ability to dynamically reconfigure and time-share common transmitters, receivers, RF front-end antenna interface filters, integrated microwave assemblies, and other components. Existing and growth capacity will allow the Comanche to meet simultaneity and latency requirements of multiband, multimode Communication Navigation Identification (CNI) signals across the entire CNI spectrum. Comanche is designed to operate with radios and protocols for the digital messages needed to communicate with any joint assets within the theater. Encryption is provided for secure voice and digital information. The aircraft communication system is normally configured for a particular mission, thereby allowing Comanche to receive and provide information to specified

operational assets based on a predetermined need. It then has the capability to adapt, in real time, to the changing mix of players, providing relevant sorted critical information to each combat element.

One of the many Comanche mission equipment packages is called Tactics Expert Function (TEF). TEF supports mission planning, cockpit information management, survivability, weapon selection, flight profile management, mission effectiveness, and SA. SA of the digital battlefield is the ability to receive and correctly correlate information depicting the status of friendly and enemy forces. SA takes data from diverse sensors, then correlates and processes the data to enhance the relative common battlefield picture.

Comanche's extensive processing power and algorithms can combine acquired information and data generated by multispectral, onboard sensors to reduce predictive errors and provide an

accurate correlated picture. ICNIA can then share the Comanche target data, including images or video, with other battlefield combat assets. Target data accuracy eliminates target ambiguity and uncertainty, thus reducing artillery or other external ordnance expenditure. ICNIA also allows tactical aircraft to use RF fire-and-forget missiles in place of line-of-sight laser-guided missiles, providing a new operational capability when the ground is obscured by weather conditions such as those experienced in Kosovo.

## **Airframe And Armament**

Designed with advanced, low-observable technologies, Comanche can conduct deep operations undetected, providing a level of survivability unmatched by any other aircraft. Low-observable technology has significantly reduced IR, radar, and acoustic signatures. Comanche will have an

embedded air-to-air capability, which requires extreme agility and maneuverability including sideward and rearward flight in excess of 80 knots. It has a self-deploy capability of 1,206 nautical miles and is designed and hardened for ship-board operations and for transportability on U.S. Air Force C-130 and larger aircraft. Comanche provides an inter-/intratheater independence not afforded by current helicopters, freeing up valuable strategic and theater airlift assets. At distances up to 700 nautical miles, Comanche can be on-station in less than 5 hours, ready to fight for the joint commander. Its flexible, lethal armament and fuel options allow Comanche to rapidly reconfigure to meet changing threat or self-deployment requirements.

### Sustainability In The Field

The all-composite airframe design provides numerous panels that allow easy access to line-replaceable parts. Other features are integrated onboard diagnostics and prognostics with unprecedented maintainability characteristics. An entire level of traditional maintenance, the intermediate level, has been eliminated, resulting in Comanche sustainment with dramatically fewer personnel and significantly less support equipment than any other comparable helicopter in the world. Comanche requires only 2.6 maintenance man-hours per flight hour, compared to 4.5 for the Kiowa Warrior. Operationally, Comanche provides a greatly reduced in-theater logistics footprint.

Supportability was key in initial contractor selection and continues to be a significant factor in all design trade-off studies. This two-level maintenance system allows Comanche to operate at a higher OPTEMPO in more austere environments. The other key feature Comanche provides is improved reliability. This is because of the embedded fault detection and fault isolation system, which clearly identifies faults and helps maintenance personnel quickly repair or replace faulty items.

### Other Comanche Features

A discussion of numerous other integrated Comanche features could fill volumes. Some of the more significant ones follow.

- Comanche is designed for continuous operations in a nuclear, biological,

and chemical environment. It is equipped with a molecular sieve, regenerative filter that removes biological and chemical agents from the air. This filter also removes water content from the air so it can be refrigerated to cool the mission equipment package, the cockpit area, and various sensors.

- A helmet-mounted display system provides pilots the capability to perform heads-up flight while enhancing SA. All information needed to maintain aircraft control, operate mission-equipment packages, and use aircraft weapons is provided in the helmet-mounted display.

- The crew stations are functionally identical and are designed to support single-pilot operation from either station.

- Cockpit displays provide imagery and aircraft situation data in a spatially relevant manner. Controls and displays are designed to provide multiple paths for presentation of information and control of subsystems.

- Color digital maps with customized tactical, navigational, and cultural symbology overlays allow crewmembers to selectively arrange and update their map according to the mission.

- An automated aviation mission-planning system with cartridge-portable update and download capability facilitates mission planning, rehearsals, and debriefs, as well as rapid data transfer to the aircraft.

### Information Dominance

Fully integrated within the reconnaissance system of systems, Comanche's capabilities provide an overwhelming synergy with members of the joint reconnaissance community. The mission equipment package includes fire control capabilities, integrated FLIR, millimeter wave-length radar, and a suite of processors and communications equipment. This equipment provides capabilities that allow the Comanche to acquire, store, correlate, and present, in a "commander-ready" format, the "must-have" information needed to attain situational dominance. It is a combat system that far surpasses existing platforms in survivability, versatility, maneuverability, lethality, reliability, and cost of ownership.

Comanche's low-observable characteristics protect the element of surprise. When combined with the advanced sensor suite,

they provide "effective standoff," allowing the Comanche to remain covert while still operating within the onboard armament system range. This capability also allows the Comanche crew to correctly *identify* targets and reduce fratricide during nonlinear operations.

### Delivered Performance

Comanche will have the sensor payload, weapons suite, and data ports to link the elements of the joint or coalition warfight. It can acquire and target mobile launchers or concealed deep threats for U.S. Air Force attack aircraft. It can also assist in maintenance of sea lines of communication or conduct show-of-force operations with the U.S. Navy, and can provide deep reconnaissance, counterbattery, and anti-tank capabilities for the Army's Light Division/Brigade Combat Teams. Comanche delivers dominant maneuver, precision engagement, and full-dimensional protection resulting in full-spectrum dominance.

### Conclusion

The U.S. Army must have a credible air armed-reconnaissance capability for operating over the extended distances envisioned in Army XXI warfighting concepts. Comanche, with its system-of-systems mission equipment package, provides a multirole, multimission capability that complements current helicopters, while dominating all operational spectrums of warfare well into this century.

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